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<b>(54) Title:</b> USE OF ENCAPSULATED ASPARTIC ACID SWEETENERS IN COATING SYRUPS FOR COATED PELLET CHEWING GUMS  <b>(57) Abstract</b>  A syrup coating for use on chewing gum and other comestibles contains a sugar or sugar alcohol and an aspartic acid sweetener encapsulated with an encapsulating agent effective to stabilize the aspartic acid sweetener. Preferably the encapsulating agent protects the aspartic acid sweetener against decomposition when the coating syrup is heated to 85 °C and held for more than two hours.		

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**USE OF ENCAPSULATED ASPARTIC  
ACID SWEETENERS IN COATING  
SYRUPS FOR COATED PELLET CHEWING GUMS**

**BACKGROUND OF THE INVENTION**

5 The present invention relates to coated comestibles, particularly hard coated chewing gum products in which an aspartic acid sweetener is contained in the syrup used to make the coating.

10 Hard coated chewing gums are very popular in many parts of the world. It is often desirable to increase the initial sweetness impact of such products, especially when using coatings of less sweet materials such as sorbitol and hydrogenated isomaltulose. Aspartame is the most common high-intensity sweetener. A number of patents disclose the use of aspartame and other artificial sweeteners in coating syrups. Exemplary of these are U.S. Patent No. 4,684,523; U.S. Patent No. 15 4,792,453; U.S. Patent No. 4,997,659 and U.S. Patent No. 5,298,263, all of which are incorporated herein by reference.

20 However, stability problems can cause a loss of sweetness when aspartame is used in coating syrups which are maintained at high temperatures for prolonged periods. Some coating operations take 48 hours to complete, and portions of the coating syrup may be maintained in a heated state for much of that time.

25 One possible solution to this problem is to increase the aspartame level in the coating syrup to obtain the

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desired level in the final product. However, this increases production costs as higher levels of aspartame, which is relatively expensive, must be used. Also because the degradation is not controlled, variability in aspartame levels may occur from batch to batch.

Another possible solution is to use aspartame as part of a dry charge in which dry powder is added to wet coated pellets during the coating process. However, dry charging may result in unsatisfactory appearance and texture in the coated product, pellet-to-pellet variability in aspartame level and loss of aspartame to dust collectors. It is also possible that aspartame in the coating may be subject to degradation.

Another high-intensity sweetener that may be used in the hard coating is alitame. U.S. Patent No. 4,997,659 discloses the use of alitame in coating syrups. However, alitame and aspartame are both aspartic acid sweeteners, and the use of alitame in chewing gum has been found to pose many of the same stability problems as aspartame.

Hence, there is a need for a syrup composition and method of coating that incorporates aspartame or alitame, and that can be used regardless of the syrup composition, but prevents the degradation of these aspartic acid sweeteners.

#### Summary of the Invention

It has been discovered that an encapsulated aspartic acid sweetener can be used in a coating syrup to provide a high-intensity sweetener and the resulting increased sweetness in the coating, and that the encapsulation stabilizes the aspartic acid sweetener against degradation during the coating process, as well as protecting against degradation during storage of the gum product.

In one aspect, the invention is a coated edible product comprising an edible core and a hard shell

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coating covering said core and formed from an aqueous syrup, the syrup comprising a sweetener selected from sugars, sugar alcohols and mixtures thereof; and an aspartic acid sweetener encapsulated with an encapsulating agent effective to stabilize the aspartic acid sweetener.

In a second aspect, the invention is a coating syrup for coating chewing gum cores comprising a sweetener selected from sugars, ~~sugar~~ alcohols and mixtures thereof, water, and an aspartic acid sweetener encapsulated by an encapsulating agent effective to stabilize the aspartic acid sweetener.

In a third aspect, the invention is a method of coating a comestible with a coating comprising the steps of providing a comestible core; providing an aspartic acid sweetener encapsulated with an encapsulating agent effective to stabilize said aspartic acid sweetener; preparing a coating syrup comprising water, a sweetener selected from sugars, sugar alcohols and mixtures thereof and said encapsulated aspartic acid sweetener; applying the coating syrup to the surface of the comestible core; and solidifying the coating syrup.

#### BRIEF DESCRIPTION OF THE DRAWING

Figure 1 shows test results of the formation of an aspartame decomposition product in example coating syrups during a 24 hour holding test.

#### DETAILED DESCRIPTION OF THE DRAWING AND PREFERRED EMBODIMENTS OF THE INVENTION

As used herein, the term "chewing gum" also includes bubble gum and the like. Unless otherwise specified, all percentages used herein are weight percents.

The present invention involves the addition of stable, encapsulated aspartic acid sweeteners (i.e., aspartame and alitame) to coating syrups which are applied to edible products, including chewing gums,

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confections and pharmaceutical products, to produce a hard shell coating. Such syrups are normally solutions or suspensions of carbohydrates (sugar or sugar alcohols) in water. Such syrups are normally maintained at high temperatures for up to several hours before being sprayed or ladled onto cores that are tumbled in a coating drum. Primarily, the encapsulation is effective to prevent degradation of the aspartic acid sweeteners while the coating is being formed. However, preferred encapsulation will also stabilize the aspartic acid sweetener during commercial storage of the resulting product.

A number of patents disclose encapsulation systems that are probably suitable for use in the present invention. These include U.S. Patent Nos. 4,673,577; 5,164,210; 4,711,784; 5,112,625; 4,931,295; 4,863,745; and 4,978,537, each of which are hereby incorporated by reference. Encapsulation systems suitable for use in the present invention will be those which can protect the sweetener against degradation when heated to 85°C in the coating syrup for at least two hours. Preferably the encapsulating agent will be effective to stabilize the aspartic acid sweetener against decomposition whereby at least 5% less aspartic acid sweetener decomposes into non-sweetening derivatives while producing the coating than would have decomposed if the aspartic acid sweetener would not have been encapsulated. Because aspartame has such high potency and is used at such low levels, and because of its high cost, even a 5% reduction in degradation is a significant benefit.

The encapsulated aspartic acid sweetener should also have a particle size sufficiently small to avoid appearance and texture problems which would be perceived by the consumer. Preferably the encapsulated aspartic acid sweetener will have a particle size of less than about 600 microns, and more preferably less than about

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100 microns. The encapsulated aspartic acid sweetener, if larger than this after encapsulation, may be ground and sieved to a desired size.

5 Because the coating syrup will typically contain water, the encapsulating agent is preferably not water soluble. Suitable encapsulants for the present invention include zein, shellac, polyvinylacetate and combinations thereof, as well as any of these three encapsulating agents combined with other encapsulants. The  
10 encapsulating agent may be applied in a variety of ways depending on which encapsulant is selected. Preferred encapsulation techniques include spray drying, fluid bed coating, granulation and extrusion/fiber spinning.

15 The coating may be composed of a sugar, preferably sucrose, or a sugar alcohol. Preferred sugar alcohols include sorbitol and xylitol. Most preferably the coating will be composed of hydrogenated isomaltulose, which is known by the trade name Palatinit. Palatinit can be applied via a conventional syrup in which all of  
20 the Palatinit is in solution. However, a preferred method, demonstrated by DRIAM Metallprodukt GMBH & Co. at a symposium in Solingen, Germany in April 1994, is to use a Palatinit suspension in which additional finely ground Palatinit is suspended in an already saturated solution.

25 The coating syrup with the encapsulated aspartic acid sweetener may readily be used to form a hard shell coating by coating or panning a core, which is preferably a pellet of chewing gum. Pellet or ball gum is prepared as conventional chewing gum, but formed into pellets that  
30 are pillow shaped or into balls. The pellets/balls can then be coated or panned by conventional panning techniques to make coated pellet gum.

35 Conventional panning procedures generally apply a liquid coating to a pellet, which is then solidified, usually by drying the coating. The coating layer is built up by successive coating and drying steps.

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The chewing gum ingredients are noncritical to the present invention. That is, the coating can be applied to conventional chewing gum center formulations in a conventional manner. The pellet may be a sugar-free or non-cariogenic chewing gum center. The coating may be used on either regular chewing gum or bubble gum centers.

In general, a chewing gum composition typically comprises a water-soluble bulk portion, a water-insoluble chewable gum base portion and typically water-insoluble flavoring agents. The water-soluble portion dissipates with a portion of the flavoring agent over a period of time during chewing. The gum base portion is retained in the mouth throughout the chew.

The insoluble gum base generally comprises elastomers, resins, fats and oils, waxes, softeners and inorganic fillers. Elastomers may include polyisobutylene, isobutylene-isoprene copolymer and styrene butadiene rubber, as well as natural latexes such as chicle. Resins include polyvinylacetate and terpene resins. Fats and oils may also be included in the gum base, including tallow, hydrogenated and partially hydrogenated vegetable oils, and cocoa butter. Commonly employed waxes include paraffin, microcrystalline and natural waxes such as beeswax and carnauba. According to the preferred embodiment of the present invention, the insoluble gum base constitutes between about 5% to about 95% of the gum. More preferably the insoluble gum base comprises between 10% and 50% of the gum and most preferably about 20% to about 35% of the gum.

The gum base typically also includes a filler component. The filler component may be calcium carbonate, magnesium carbonate, talc, dicalcium phosphate or the like. The filler may constitute between about 5% and about 60% of the gum base. Preferably, the filler comprises about 5% to about 50% of the gum base.

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Gum bases typically also contain softeners, including glycerol monostearate and glycerol triacetate. Further, gum bases may also contain optional ingredients such as antioxidants, colors and emulsifiers. The present invention contemplates employing any commercially acceptable gum base.

The water-soluble portion of the chewing gum may further comprise softeners, sweeteners, flavoring agents and combinations thereof. The sweeteners often fill the role of bulking agents in the gum. The bulking agents generally comprise from about 5% to about 90%, preferably from about 20% to about 80%, and most preferably from about 30% to about 60% of the gum.

Softeners are added to the chewing gum in order to optimize the chewability and mouth feel of the gum. Softeners, also known in the art as plasticizers or plasticizing agents, generally constitute between about 0.5% to about 15% of the chewing gum. Softeners contemplated by the present invention include glycerin, lecithin and combinations thereof. Further, aqueous sweetener solutions such as those containing sorbitol, hydrogenated starch hydrolyzates, corn syrup and combinations thereof may be used as softeners and binding agents in gum.

The coating syrup of the present invention will most likely be used on sugarfree or non-cariogenic formulations. Generally sugarless sweeteners include components with sweetening characteristics but which are devoid of the commonly known sugars and comprise, but are not limited to, sugar alcohols such as sorbitol, mannitol, xylitol, hydrogenated starch hydrolyzates, maltitol and the like, alone or in any combination. Other non-cariogenic bulking agents may also be used. These include polydextrose, fructooligosaccharide (FOS), oligofructose, indigestible dextrins, and modified non-cariogenic materials.

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5 A flavoring agent may be present in the chewing gum  
in an amount within the range of from about 0.1% to about  
10%, and preferably from about 0.5% to about 3%, of the  
gum. The flavoring agents may comprise essential oils,  
synthetic flavors, or mixture thereof including, but not  
limited to, oils derived from plants and fruits such as  
citrus oils, fruit essences, peppermint oil, spearmint  
oil, clove oil, oil of wintergreen, anise, and the like.  
10 Artificial flavoring components are also contemplated for  
use in gums of the present invention. Those skilled in  
the art will recognize that natural and artificial  
flavoring agents may be combined in any sensorially  
acceptable blend. All such flavors and flavor blends are  
contemplated by the present invention.

15 Optional ingredients such as colors, emulsifiers and  
pharmaceutical agents may be added to the chewing gum.

In general, chewing gum is manufactured by  
sequentially adding the various chewing gum ingredients  
to a commercially available mixer known in the art.  
20 After the ingredients have been thoroughly mixed, the gum  
mass is discharged from the mixer and shaped into the  
desired form such as by rolling into sheets and cutting  
into sticks, extruding into chunks or casting into  
pellets.

25 Generally, the ingredients are mixed by first  
melting the gum base and adding it to the running mixer.  
The base may also be melted in the mixer itself. Color  
or emulsifiers may also be added at this time. A  
softener such as glycerin may also be added at this time,  
30 along with any syrup and a portion of the bulking  
agent/sweetener. Further portions of the bulking  
agent/sweetener may then be added to the mixer. A  
flavoring agent is typically added with the final portion  
of the bulking agent. A high-intensity sweetener is  
35 preferably added after the final portion of bulking agent  
and flavor have been added.

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5 The entire mixing procedure typically takes from five to fifteen minutes, but longer mixing times may sometimes be required. Those skilled in the art will recognize that many variations of the above described procedure may be followed.

In addition to chewing gum, the invention may be practiced with a large variety of confectionary cores, which are well known in the art.

10 Besides the sugar or sugar alcohol and encapsulated aspartic acid sweetener, the coating may also contain other components such as flavoring agents, dispersing agents, coloring agents, film formers and binding agents. Flavoring agents contemplated by the present invention include those commonly known in the art and already  
15 discussed herein. The flavoring agents may be added to the coating syrup in an amount such that the coating will contain about 0.2% to about 1.2%, and preferably about 0.7% to about 1%, flavoring agent.

20 Artificial sweeteners in addition to the encapsulated aspartic acid sweeteners may be added to the coating syrups, including but not limited to synthetic substances, saccharin, thaumatin, sucralose, saccharin salts, and acesulfame-K. The artificial sweetener may be added to the coating syrup in an amount such that the  
25 coating will contain about 0.005% to about 0.5%, and preferably about 0.01% to about 0.3%, artificial sweetener.

30 Dispersing agents are often added to syrup coatings for the purpose of whitening and tack reduction. Dispersing agents contemplated by the present invention to be employed in the coating syrup include titanium dioxide, talc, or any other antistick compound. Titanium dioxide is a presently preferred dispersing agent of the present invention. The dispersing agent may be added to  
35 the coating syrup in amounts such that the coating will

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contain between about 0.1% to about 1%, and preferably about 0.3% to about 0.6%, of the agent.

5           Coloring agents are preferably added directly to the syrup in the dye or lake form. Coloring agents contemplated by the present invention include food quality dyes. Film formers preferably added to the syrup include methyl cellulose, gelatins, hydroxypropyl cellulose, ethyl cellulose, hydroxyethyl cellulose, carboxymethyl cellulose and the like and combinations thereof. Binding agents may be added either as an initial coating on the chewing gum center or may be added directly into the syrup. Binding agents contemplated by the present invention include alginate, cellulosics, vegetable gums and the like.

10           In general, the hard coating process is carried out in a rotating pan. Gum center pellets to be coated are placed into the rotating pan to form a moving mass. The material or syrup which will eventually form the hard coating is applied or distributed over the gum center pellets. Flavoring agents may be added before, during and after applying the syrup to the gum centers. Once the coating has dried to a hard surface, additional syrup additions may be made to produce a plurality of coatings or multiple layers of hard coating.

15           In the hard coating panning procedure, syrup is added to the gum center pellets at a temperature in the range of about 100°F to about 220°F. Preferably, the syrup temperature is between about 150°F and to about 200°F throughout the process in order to prevent the sugar or sugar alcohol in the syrup from crystallizing. The syrup may be mixed with, sprayed upon, poured over, or added to the gum center pellets in any way known to those skilled in the art.

20           The gum center pellets may be coated with a single hard layer or a plurality of hard layers. In general, a plurality of layers is obtained by applying single coats,

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allowing the layers to dry, and then repeating the process. Any number of coats may be applied to the gum center pellets. Preferably, no more than about 75 coats are applied to the gum center pellets. More preferably, less than about 60 coats are applied and most preferably, about 30 to about 60 coats are applied. In any event, the present invention contemplates applying an amount of syrup sufficient to yield a hard coated chewing gum product containing about 10 to about 75% coating. Preferably, the final product will contain between about 20% and about 50% coating.

Those skilled in the art will recognize that in order to obtain a plurality of hard coated layers, a plurality of premeasured aliquots of coating syrup may be applied to the gum center pellets. It is contemplated, however, that the volume of aliquots of syrup applied to the gum center pellets may vary throughout the coating procedure.

The present invention contemplates that the syrup preferably is at its saturation point at coating temperatures. Preferably the coating syrup comprises between about 45% to about 90% sugar or sugar alcohol solids. More preferably, the syrup will contain about 60% to about 85%, and most preferably about 65% to about 85%, sugar or sugar alcohol solids. The syrup may comprise about 9% to about 50% water or any other food quality solvent in an amount sufficient to yield a hard coating. The preferred water content will vary depending on the sugar or sugar alcohol used.

In addition, it is contemplated by the present invention that a flavoring agent may be added to the syrup, or applied to the gum center pellets while the syrup coating is drying or after the coating has dried. Furthermore, the flavoring agent may be applied after any sequence of coats, for example, the third, twelfth, eighteenth, etc. coat.

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Once a coating of syrup is applied to the gum center pellets, the present invention contemplates drying the wet syrup in an inert medium. A preferred drying medium comprises air. Preferably, forced drying air contacts the wet syrup coating in a temperature range of about 80° to about 115°F. More preferably, the drying air is in the temperature range of about 90° to about 105°F. The invention also contemplates that the drying air possess a relative humidity of less than about 15 percent. Preferably, the relative humidity of the drying air is less than about 8 percent.

The drying air may be passed over and admixed with the syrup coated gum centers in any way commonly known in the art. Preferably, the drying air is blown over and around the syrup coated gum center at a flow rate of about 2800 cubic feet per minute. Furthermore, if a flavoring agent is applied after a syrup coating has been dried, the present invention contemplates drying the flavoring agent with or without the addition of a drying medium.

After the coating is applied, a wax polish layer may be added as a final step. Such a polish layer may include a colorant, as disclosed in U.S. Patent No. 5,171,589, incorporated herein by reference. Also, it may be preferable for some gum compositions to include an emulsifier subcoat between the core and the hard coating, as described in U.S. Patent No. 5,135,761, also incorporated herein by reference.

### Examples

The following examples are not to be construed as a limitation upon the present invention, but are included merely as an illustration of embodiments of the present invention.

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Encapsulated Aspartame

5 An encapsulated aspartame ingredient was prepared as follows. A dry blend of 85% aspartame and 15% hydroxypropylmethycellulose was prepared. Water was added incrementally to the dry blend while mixing to produce a damp mix. (A quantity of water equal to approximately half the weight of the dry blend is preferably used, more or less as needed to produce the desired texture). The damp mix was dried on paper lined trays at 170°F/5% RH with fans for about 16 hours to yield a dry granular product having approximately 4% water. After cooling, the granular product was ground and the portion which passed through a 0.027 inch round hold screen was collected as a stage one product.

15 One part hydroxypropylmethycellulose was hydrated in four parts water for 36 hours. An aqueous solution of zein was prepared by slowly dispersing 13 parts zein in 70 parts water while maintaining the pH between 9.0 and 10.0 with additions of 4% NaOH solution. After the zein was completely dispersed, the pH was raised to 11.8 (with additional NaOH solution, approximately 7 parts total) and stirring was continued for 30 minutes to ensure complete dissolution.

25 To 90 parts zein solution was added 10 parts of the HPMC solution in increments with continued stirring. Thereafter, 27 parts of the stage one product was granulated by adding 13 parts of the zein/HPMC solution slowly with stirring to obtain a damp mix. The damp mix was then tray dried as before, ground and sifted into two portions, 1) coarse material passing through a No. 30 U.S. Standard sieve (530 micron) and retained on a No. 200 U.S. Standard sieve (74 micron), and 2) fine material passing through the No. 200 sieve and collected in a pan. The encapsulated ingredients contained approximately 78% aspartame by weight.

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Coating Syrup

To test the stability of various forms of aspartame in coating syrups, the following coating syrup was prepared:

Water	1.0 kg
Coarse Hydrogenated Isomaltulose (Isomalt Type M)	1.5 kg
Gum Arabic Solution (50% Gum Arabic, 50% water)	0.15 kg
Titanium Dioxide	0.0325 kg

When all ingredients were in solution, 0.75 kg of fine ground hydrogenated isomaltulose (Isomalt Type PF) was dispersed in the syrup to produce a hydrogenated isomaltulose suspension coating syrup.

Comparative Example A

To 1.0 kg of the above coating syrup was added 4.3g of free aspartame.

Example 1

To 1.0 kg of the above coating syrup was added 5.5g of the fine encapsulated aspartame described above.

Example 2

To 1.0 kg of the above coating syrup was added 5.5g of the coarse encapsulated aspartame described above.

The syrups of Comparative Example A and Examples 1 and 2 were placed in jars and heated in a shaking water bath set to 60°C for 24 hours. Samples of the syrup were removed at 0, 3, 6 and 24 hours and immediately frozen. Later, the samples were tested for aspartame and diketopiperazine (DKP), an aspartame degradation product. The amounts of aspartame as a percentage of the solution and as a percentage of the initial amount of aspartame measured, at 0, 3, 6 and 24 hours, are given in Table 1. Table 2 shows, as a percentages of the solution, the amount of DKP initially and the amount of DKP increase since time 0 at 3, 6 and 24 hours.

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Table 1% Aspartame @ hour  
(% of initial)

	<u>0</u>	<u>3</u>	<u>6</u>	<u>24</u>
Comparative Example A Free APM	.419 (100)	.406 (97)	.399 (95)	.373 (89)
Example 1 Fine Enc. APM	.453 (100)	.436 (96)	.433 (96)	.389 (86)
Example 2 Coarse Enc. APM	.442 (100)	.393 (89)	.426 (96)	.425 (96)

Table 2

Initial % DKP      Increase In % DKP @ hour

	<u>0</u>	<u>3</u>	<u>6</u>	<u>24</u>
Comparative Example A Free APM	.003	.002	.004	.017
Example 1 Fine Enc. APM	.012	.002	.004	.014
Example 2 Coarse Enc. APM	.008	.001	.004	.013

Figure 1 shows the trend line of DKP gains in the three syrups graphically. It is clear that the encapsulated aspartame samples were more stable than the free aspartame during the test.

Example 3

A coated chewing gum according to the present invention was prepared as follows:

Gum centers were mixed and formed using the coarse encapsulated aspartame described above and conventional processing techniques according to the following formula:

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	Sorbitol	40.84
	Gum Base	40.75
	Mannitol	10.00
5	Sorbitol Solution	
	(70% Sorbitol,	
	30% Water)	5.70
	Peppermint Flavor	1.30
	Menthol	0.50
10	Coarse Enc. APM	0.08
	Lecithin	<u>0.83</u>
		100.00

A coating syrup was prepared by hydrating 5.4 kg of gum arabic in an equal quantity of water for 12 hours. Next, 150 kg of hydrogenated isomaltulose was dissolved in 100 kg water at 85°C. The solution was cooled to between 55°C and 60°C and the gum arabic solution was added. 60 kg of fine ground hydrogenated isomaltulose, 1.90 kg titanium dioxide, and 1.68 kg of the fine encapsulated APM described above were dispersed in the syrup by means of a high speed homogenizer.

350 kg of the gum centers were tumbled in a Dumoulin coater. About 266.5 kg of syrup was sprayed onto the pellets in increments with drying between each application. Near the end of the coating process, 1.84 kg of a 50/50 blend of peppermint oil and menthol were sprayed on the pellets through a separate nozzle in the coaters. Finally, 0.074 kg of carnauba wax was applied as a finishing coat in a dedicated polishing drum.

The entire coating process took about five hours. The final product had a coating of approximately 34.56% based on the total weight. The pellets were considered to be of commercial quality and the aspartame is believed to be stable over the product's shelf life.

It should be appreciated that the compositions and methods of the present invention are capable of being incorporated in the form of a variety of embodiments, only a few of which have been illustrated and described above. The invention may be embodied in other forms without departing from its spirit or essential characteristics. It will be appreciated that the

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addition of some other ingredients, process steps, materials or components not specifically included will have an adverse impact on the present invention. The best mode of the invention may therefore exclude ingredients, process steps, materials or components other than those listed above for inclusion or use in the invention. However, the described embodiments are to be considered in all respects only as illustrative and not restrictive, and the scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

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## WE CLAIM:

1. A coated edible product comprising:
  - a) an edible core and
  - b) a hard shell coating covering said coreand formed from an aqueous syrup, the syrup comprising:
  - i) a sweetener selected from sugars, sugar alcohols and mixtures thereof; and
  - ii) an aspartic acid sweetener encapsulated with an encapsulating agent effective to stabilize said aspartic acid sweetener.
2. The coated product of claim 1 wherein the edible core comprises a confectionary.
3. The coated product of claim 1 wherein the edible core comprises chewing gum.
4. The coated product of claim 1 wherein the hard shell coating is sugarless.
5. The coated product of claim 1 wherein the sugar or sugar alcohol sweetener comprises hydrogenated isomaltulose.
6. The coated product of claim 5 wherein the coating is formed from a syrup comprises both dissolved and suspended hydrogenated isomaltulose.
7. The coated product of claim 1 wherein the encapsulating agent comprises zein.
8. The coated product of claim 7 wherein the encapsulating agent further comprises hydroxypropylmethyl cellulose.

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9. The coated product of claim 1 wherein the encapsulating agent comprises shellac.

5 10. The coated product of claim 1 wherein the encapsulating agent comprises polyvinylacetate.

11. The coated product of claim 1 wherein the aspartic acid sweetener comprises aspartame.

10 12. The coated product of claim 1 wherein the aspartic acid sweetener comprises alitame.

15 13. The coated product of claim 1 wherein the encapsulating agent is effective against decomposition whereby at least 5% less aspartic acid sweetener decomposes into non-sweetening derivatives while producing the coating than would have decomposed if the aspartic acid sweetener would not have been encapsulated.

20 14. A coating syrup for coating chewing gum cores comprising:

a) a sweetener selected from sugars, sugar alcohols and mixtures thereof;

b) water; and

25 c) an aspartic acid sweetener encapsulated by an encapsulating agent effective to stabilize said aspartic acid sweetener.

30 15. The coating syrup of claim 14 wherein the encapsulated aspartic acid sweetener has a particle size of less than 600 microns.

35 16. The coating syrup of claim 14 wherein the encapsulated aspartic acid sweetener has a particle size of less than about 100 microns.

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17. The coating syrup of claim 14 further comprising a binding agent.

5 18. The coating syrup of claim 14 further comprising a dispersing agent.

10 19. The coating syrup of claim 14 wherein the aspartic acid sweetener comprises aspartame, alitame or mixtures thereof.

20. The coating syrup of claim 14 wherein the syrup comprises:

- 15 a) about 45% to about 90% sugar or sugar alcohol sweetener;  
b) about 5% to about 50% water; and  
c) an effective amount of encapsulated aspartic acid sweetener to provide a desired sweetness in the coating.

20 21. The coating syrup of claim 14 wherein the encapsulation agent is effective to inhibit degradation of the aspartic acid sweetener in the syrup.

25 22. A method of coating a comestible with a coating comprising the steps of:

- 30 a) providing a comestible core;  
b) providing an aspartic acid sweetener encapsulated with an encapsulating agent effective to stabilize said aspartic acid sweetener;  
c) preparing a coating syrup comprising water; a sweetener selected from sugars, sugar alcohols and mixtures thereof; and said encapsulated aspartic acid sweetener;  
35 d) applying the coating syrup to the surface of the comestible core; and  
e) solidifying the coating syrup.

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23. The method of claim 22 wherein the step of solidifying the coating syrup comprises evaporating water from the syrup.

24. The method of claim 22 wherein the syrup is solidified to form a hard shell coating.

25. The method of claim 22 wherein the comestible core comprises chewing gum.

26. The method of claim 22 wherein the syrup is heated to a temperature of between about 60° and about 85°C and at least a portion of the syrup is maintained at that temperature for over two hours.

27. The method of claim 22 wherein the coating syrup is prepared by heating the syrup to dissolve at least a portion of the sugar or sugar alcohol sweetener in the water and mixing fine particles of said sugar or sugar alcohol sweetener into said syrup to form a suspension.

28. The method of claim 27 wherein the sugar or sugar alcohol comprises hydrogenated isomaltulose and fine particles of hydrogenated isomaltulose are used to form said suspension.

29. The method of claim 22 wherein the encapsulated aspartic acid sweetener has a particle size of less than 600 microns.

30. The method of claim 22 wherein the encapsulating aspartic acid sweetener has a particle size of less than about 100 microns.

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31. The method of claim 22 wherein the aspartic acid sweetener comprises aspartame, alitame or mixtures thereof.

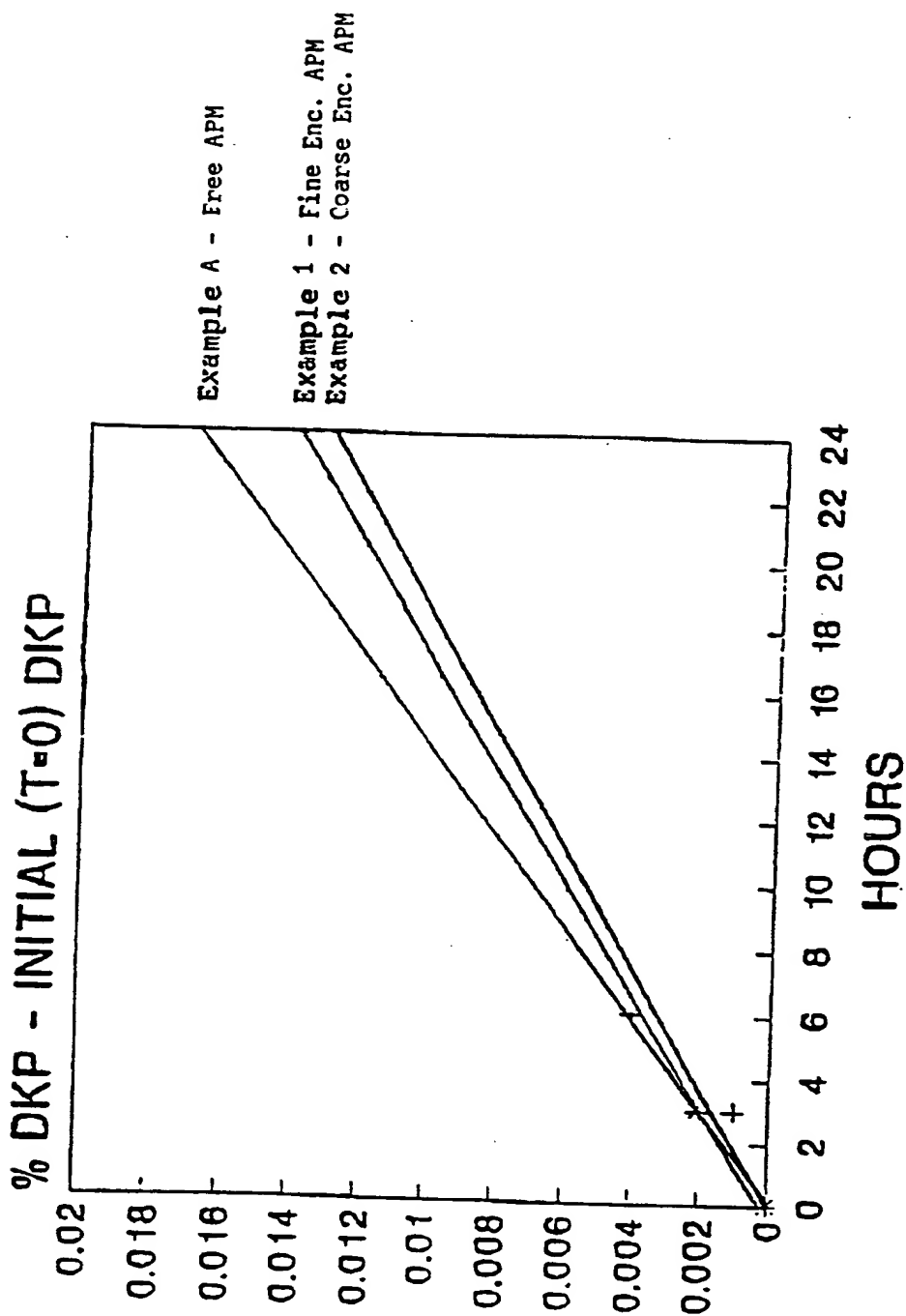
5

32. The method of claim 22 wherein the encapsulating agent is effective to inhibit degradation of the aspartic acid sweetener in the presence of heat and water.

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Figure 1  
PALATINIT SYRUP - DKP GENERATION  
SYRUP TEMPERATURE STUDY @ 60C



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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US96/12022

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A23G 3/30

US CL :426/5

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/3, 4, 5, 6, 96, 99, 310

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

search terms: chewing gum, coating, syrup, coating syrup, apm, aspartame

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,087,460 A (CHERUKURI ET AL) 11 February 1992, col. 15, lines 3-13 and col. 10, line 50 - col. 11, lines 1-48.	1-32
Y	US 5,248,508 A (REED ET AL) 28 September 1993, abstract and claims.	5, 6, 20, 28
Y	US 4,792,453 A (REED ET AL) 20 December 1988, abstract and claims.	5, 6, 20, 28
Y	US 5,270,061 A (REED ET AL) 14 December 1993, abstract and claims.	5, 6, 28

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	* T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* A* document defining the general state of the art which is not considered to be of particular relevance	* X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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* O* document referring to an oral disclosure, use, exhibition or other means	
* P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

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15 NOV 1996

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